Route Guidance Service Using the Internet

Background of the Invention:

1. Field of the Invention:

5   The present invention relates to a method of offering a service by using the Internet, and more particularly to a method of offering a route guidance service to offer to users via the Internet optimum routes for vehicular travel in real time.

10   2. Description of the Related Art:

Services offering delivery by automobiles or motorcycles have come into common use. Because this service involves delivering articles to a plurality of locations by a vehicle, the efficiency of the delivery

15   varies considerably according to the delivery route. Efficient routing not only allows a savings in time, but also reduces the amount of vehicle fuel that is consumed.

A wide variety of businesses offer delivery by truck or delivery of articles by automobiles, and in

20   addition to delivery, many businesses and services involve travel to a plurality of locations, such as business sales services that make the rounds of customers by automobile or advertising and publicity operations, electioneering activities, and home care services that

25   travel over large areas by automobile.

One method of the prior art for obtaining an

efficient route for visiting a plurality of sites is a
method in which the shortest distance between given
points is calculated based on information that has been
registered in advance, such as in an onboard navigation
5   device.

This method enables a route to be obtained for
visiting a plurality of sites by the shortest distance.

With the popularization and widespread use of the
Internet in recent years, a wide variety of information
10   is now offered to the public over the Internet, and a
wide variety of services can also be offered. In addition,
various businesses have been created for offering
information and services over the Internet.

Given these circumstances, map information and
15   route information are being offered over the Internet.
One form of this information that is offered over the
Internet is a map of the vicinity of a destination that
is posted so as to allow viewing on a home page. A user
is thus able to view a map of the vicinity of a
20   destination by applying conditions of the destination as
input to a personal computer.

The optimum route to a destination can change from
minute to minute due to traffic conditions such as
accidents or naturally occurring traffic congestion as
25   well as blocked traffic or alternating one-way traffic
due to roadwork.

Methods of the prior art in which an optimum route is calculated based on information that has been registered in advance cannot cope with such changes in traffic conditions because calculations are based on

5   registered information, and this method therefore will not necessarily provide the optimum route for a particular point in time.

In order to obtain the optimum route based on information that is offered over the Internet, the driver

10   must estimate the optimum route from map information based on his or her own experience. However, traffic conditions cannot be obtained from map information, and inevitably, there is no guarantee that the ideal route at a particular time can be obtained.

15   In order to obtain the optimum route for a particular time, a route that is obtained by the above-described methods must be modified based on traffic information from the radio, and getting the optimum route therefore requires knowledge that is obtained only

20   through experience.

Finally, it was impossible in the above-described methods of the prior art to ascertain whether or not a determined route was in fact the optimum route.

25   Summary of the Invention:

It is an object of the present invention to provide

3

a route guidance method, system and device that direct a
user in real time to the optimum route according to
changing traffic conditions.

To achieve the above-described object, according to
the route guidance method of the present invention, map
information including information regarding the distances
along roads on a map or the time required to travel on
these roads is stored in advance, and via the Internet
both site information, which is information indicating a
plurality of sites that are to be visited, and site-to-
site information, which includes real-time information on
traffic conditions of roads, are obtained and stored in a
storage medium. A route by which a plurality of sites
can be visited in the shortest time or by shortest
distance are then extracted as an optimum route based on
the map information, site information, and site-to-site
information. The extracted optimum route is then reported
to the user by way of the Internet.

A user can thus easily obtain in real time a route
for visiting a plurality of sites in the shortest time or
by shortest distance according to traffic conditions at
that point in time.

The above and other objects, features, and
advantages of the present invention will become apparent
from the following description based on the accompanying
drawings, which illustrate examples of preferred

4

embodiments of the present invention.

Brief Description of the Drawings

Fig. 1 is a block diagram of a route guidance

5   system according to an embodiment of the present

invention;

Fig. 2 is a block diagram showing the configuration

of a route guidance device according to this embodiment;

Fig. 3 is a sequence chart showing an example of

10   the operation of the route guidance system of this

embodiment;

Fig. 4 shows an example of site information;

Fig. 5 shows an example of site-to-site

information;

15   Fig. 6 is a flow chart showing the progression of

processing of the route guidance device;

Fig. 7 is a flow chart showing the operation of a

route guidance system;

Fig. 8 shows an example of site information that

20   includes predicted work time at each site;

Fig. 9 shows an example of site information that

includes information indicating whether articles are to

be delivered or collected at each point;

Fig. 10 shows an example of site information that

25   includes designated priorities for the delivery of

articles at each site;

Fig. 11 shows an example of site information that gives article attributes that include the size, weight, and degree of value of articles to be delivered at each site;

Fig. 12 shows an example of the content of site information that includes information regarding times of absence;

Fig. 13 shows an example of site information that includes customer request conditions for each site;

Fig. 14 is a sequence chart showing an example of the updating operation of site-to-site information for a case in which site-to-site information is periodically updated; and

Fig. 15 is a sequence chart showing an example of the operation of extracting the ideal route for a case in which site-to-site information is periodically updated.

Detailed Description of the Preferred Embodiments

The present invention implements a service that extracts optimum routes when a plurality of sites designated from the user are to be visited and provides the extracted optimum routes to the user by way of the Internet.

Although a variety of businesses and operations involve traveling to a plurality of sites, the following embodiment is described taking as an example the delivery

of articles by a home delivery business. In this example, the plurality of sites on the route are all within the delivery area of a business office to which the traveler belongs, and the traveler travels by automobile by way of

5   predetermined route sites and delivers articles at each site. Some of the articles have designated delivery time blocks during which the articles should be delivered. The traffic conditions within the delivery area are in a state of constant change and the amount of time required

10   for travel over a route therefore varies even for the same route according to the time of travel.

Referring now to Fig. 1, there is shown a route guidance system according to an embodiment of the present invention comprising route guidance device 1, user

15   terminal 2, and traffic information-providing device 3. Route guidance device 1, user terminal 2, and traffic information-providing device 3 are connected by way of Internet 4 to enable transmission and reception of data among these components.

20   User terminal 2 is a personal computer, a portable telephone, or portable information terminal (Personal Digital Assistant (PDA)) used by a traveler or a person creating a plan of a travel route (hereinbelow referred to as the user) and is capable of accessing route

25   guidance device 1 to send and receive data over Internet 4 and to display data.

Traffic information-providing device 3 is an existing device that provides, by way of Internet 4, information on traffic conditions such as traffic blockages, alternating one-way traffic, or traffic congestion.

Route guidance device 1 extracts a route by which a plurality of sites that have been designated by the user can be visited in the shortest time or by shortest distance and provides the route to the user.

Referring to Fig. 2, route guidance device 1 includes processor 10 and storage unit 14. Processor 10 includes site information-receiving unit 11, site-to-site information input unit 12, and optimum route extraction unit 13. Storage unit 14 includes site information storage unit 15, site-to-site information storage unit 16, and map information storage unit 17.

Site information storage unit 15 stores, as site information, information that includes the location of departure of user terminal 2 and a plurality of route sites that have been designated by the user.

Site-to-site information storage unit 16 stores, as site-to-site information, traffic conditions of roads such as traffic blockages, alternating one-way traffic, and traffic congestion.

Map information storage unit 17 stores in advance map information of the entire area within the delivery

area. Map information includes distance information for calculating the distance between two sites and time information regarding the time to travel between two sites.

5   Site information-receiving unit 11 receives site information from user terminal 2 and stores this information in site information storage unit 15.

Site-to-site information input unit 12 accesses traffic information-providing device 3, receives site-to-

10   site information, and stores this information in site-to-site information storage unit 16.

Optimum route extraction unit 13 reads site information and site-to-site information from site information storage unit 15 and site-to-site information

15   storage unit 16, respectively, and extracts the route having the shortest time and the route having the shortest distance while referring to the map information of map information storage unit 17 to send the extracted information to user terminal 2 as optimum route

20   information. The optimum route information that is received at user terminal 2 is displayed on a screen.

The operation of the route guidance system of the present embodiment will next be explained with reference to Figs. 3 to 6.

25   Referring first to Fig. 3, the user uses user terminal 2 to access route guidance device 1, creates

site information in accordance with the screen, and sends
the information to route guidance device 1. As shown in
Fig. 4, the site information includes information
regarding the departure time, the location of departure,
5   the addresses of a plurality of route sites, designated
delivery time blocks for each route site, and information
indicating whether or not a delivery has been made.

In route guidance device 1, the site information is
received at site information-receiving unit 11 and stored
10   in site information storage unit 15. Site-to-site
information input unit 12 of route guidance device 1
accesses traffic information-providing device 3 by way of
Internet 4, obtains site-to-site information, and stores
the site-to-site information in site-to-site information
15   storage unit 16. As shown in Fig. 5, site-to-site
information includes information regarding blocked
traffic, information regarding alternating one-way
traffic, and information regarding traffic congestion.

Route guidance device 1 next extracts the shortest
20   time route and the shortest distance route in optimum
route extraction unit 13.

Distance information that is included in the map
information is used when extracting the shortest distance
route in optimum route extraction unit 13. If a traffic
25   blockage is included within the route at this time, the
route is excluded. On the other hand, when extracting the

shortest time route in optimum route extraction unit 13,
time information in the map information is used in
calculating travel time and a prescribed time that has
been set in advance is used as the work time at each site.

5   At this time, routes having traffic blockages are
excluded, and the required time is revised if there is
alternating one-way traffic or traffic congestion. The
required time is taken as, for example, three times the
normal time for alternating one-way traffic and five

10   times the normal time for traffic congestion. Revision
for traffic congestion may be carried out using a
plurality of stages depending on the severity of the
traffic congestion. In addition, if a delivery time block
has been set for a route site, routes are excluded if

15   travel by that route results in a time of arrival at that
site that is outside the designated delivery time block.

After the shortest time route and shortest distance
route have been extracted, this information is sent as
optimum route information from route guidance device 1 to

20   user terminal 2. The optimum route information is
displayed on a screen at user terminal 2, and the user
begins travel based on the optimum route information that
is displayed on the screen of user terminal 2. User
terminal 2 may store map information within the delivery

25   area beforehand. In such a case, the shortest time route
and shortest distance route can be displayed together

11

with a map on the screen of user terminal 2.

Alternatively, map information may be included in the

optimum route information. In this case as well, the

shortest time route and shortest distance route can be

5   displayed together with a map on the screen of user

terminal 2.

The optimum route information includes the shortest

time route and the shortest distance route, the shortest

time route enabling a saving of time and the shortest

10   distance route enabling a saving of vehicle fuel. The

user can choose either of these routes.

When the user has arrived at the next site and has

completed the work at that site, the user again uses user

terminal 2 to access route guidance device 1 and extract

15   optimum routes. The user subsequently extracts the

optimum routes again in the same way at each site upon

completing delivery at that site.

Fig. 6 shows an example of site information that is

provided to route guidance device 1 from user terminal 2

20   when re-extracting the optimum routes. In Fig. 6, route

sites in which "○" is entered in the "route completion

column" are sites that have already been visited. Site

information (Fig. 4) that has been provided to route

guidance device 1 previously can be revised and used.

25   When site information such as shown in Fig. 4 is

provided from user terminal 2 to route guidance device 1,

12

route guidance device 1 extracts the optimum route for traveling to sites that have not yet been visited.

Fig. 7 illustrates a flow chart showing the operations of route guidance device 1.

At Step 101, site information from user terminal 2 is received by site information-receiving unit 11. Then, at Step 102, site-to-site information input unit 12 accesses traffic information providing device 3 to obtain site-to-site information. The site information and site-to-site information are stored in site information storage unit 15 and site-to-site information storage unit 16, respectively. At Step 103, optimum route extraction unit 13 extracts the optimum routes based on the site information, site-to-site information, and map information stored in map information storage unit 17. At Step 104, optimum route extraction unit 13 sends the optimum route information to user terminal 2.

According to the route guidance system of the present embodiment, when a user uses user terminal 2 to access route guidance device 1 by way of Internet 4 and applies site information as input, site-to-site information is obtained from traffic information providing device 3 at route guidance device 1, the shortest time route and shortest distance route are extracted based on site information, site-to-site information, and pre-recorded map information, and these

13

routes are reported to user terminal 2 by way of Internet 4. The optimum routes according to conditions at that point in time can thus be obtained in real time and travel in the shortest time or by the shortest route can

5 be facilitated.

In the present embodiment, the user does not need to again extract the optimum route at each site. That is, if the user must again travel to the same delivery site because a recipient was not in or if traffic conditions

10 of roads have changed, the user may re-extract the optimum routes and modify his plan as necessary.

Rather than a device of an already existing website, traffic information-providing device 3 in the present embodiment may be a device for the exclusive use

15 of this system that provides information by way of Internet 4 regarding traffic blockages, alternating one-way traffic, or traffic congestion.

User terminal 2 may be a device capable of detecting its own position such as a portable telephone

20 that incorporates a GPS receiver or a PHS terminal that is capable of obtaining positional information from a communication system. In such cases, when the current location is used as the location of departure, user terminal 2 itself automatically obtains positional

25 information and describes it in the site information, thereby relieving the user of the need to input the

location of departure.

Site information may further include the predicted work time at each site, as shown in Fig. 8. The predicted work time is applied as input from user terminal 2, transmitted to route guidance device 1 from user terminal 2, and stored corresponding to each site in site information storage unit 15. In this case, the use of the predicted work time of each site to calculate the travel time raises the accuracy of the calculated travel time.

When articles are picked up as well as delivered, the site information may include information indicating whether articles are to be delivered or picked up at each site, as shown in Fig. 9. The delivery/pick-up category is applied as input from user terminal 2, transmitted from user terminal 2 to route guidance device 1, and stored corresponding to each site in site information storage unit 15.

When a full load of articles at departure leaves no empty cargo space, work must begin with deliveries. In such cases, a route may be selected in route guidance device 1 using the delivery/pick-up category such that delivery work is given priority, thereby eliminating the problem of lack of cargo space for articles that are to be picked up.

As shown in Fig. 10, the site information may also include designated delivery times for articles that are

15

to be delivered at each site. Designated delivery times are applied as input from user terminal 2, sent from user terminal 2 to route guidance device 1, and stored corresponding to each site in site information storage

5   unit 15. Designated delivery times are times designated when articles must be delivered precisely at a prescribed time. In this case, the user arrives at the site before the designated delivery time and waits until the designated delivery time. By setting this condition and

10 optimizing the delivery route, route guidance device 1 enables efficient routing that carefully observes delivery times that are designated by customers.

As shown in Fig. 11, site information may also be given article attributes that include the size and weight

15 of articles that are to be delivered at each site. Article attributes are applied as input from user terminal 2, sent from user terminal 2 to route guidance device 1, and stored corresponding to each site in site information storage unit 15. When there are sites at

20 which articles are to be picked up, the use of article attributes allows determination at route guidance device 1 of whether articles can be picked up or not, thereby eliminating the possibility when making a visit based on optimum route information that articles cannot be picked

25 up because of a lack of free cargo space or because the load limit of the vehicle has been exceeded.

16

The site information may also include absence time block information as shown in Fig. 12 when a time block is known in advance during which no one will be in at a site. An absence time block is applied as input from user terminal 2, transmitted from user terminal 2 to route guidance device 1, and stored corresponding to each site in site information storage unit 15. When extracting optimum routes in such a case, routes in which an arrival time at a site falls within an absence time block of that site are excluded, thereby enabling efficient travel that avoids visits during the absence of recipients.

Site information may further be provided with customer request conditions for each site as shown in Fig. 13. Customer request conditions are communicated from a recipient that is absent to the delivery pick-up center by, for example, telephone, and then communicated to, for example, the portable telephone of the delivery person. These customer request conditions are applied as input from user terminal 2, transmitted from user terminal 2 to route guidance device 1, and stored corresponding to each site in site information storage unit 15. A customer request condition is information for requesting re-delivery from an absent recipient and may include a designated delivery time block or a designated delivery time. Route guidance device 1 can re-optimize the delivery route to include a customer request condition,

thereby enabling an improvement in customer service and a more efficient delivery operation.

Site-to-site information may also include weather conditions. In this case, weather information is used to

5   revise the time to travel between two sites when calculating travel time, thereby reducing discrepancies in travel time that are caused by weather. For example, because the time to travel between sites can be expected to increase during inclement weather, a uniform 30%

10 increase of travel time can be considered. This weather information may be applied as input from user terminal 2, or information provided on Internet 4 may be used. When information provided on Internet 4 is used, route guidance device 1 automatically accesses a site that

15 provides this information to obtain weather information.

Site-to-site information may further include predicted travel times of major roads. The predicted travel time is used as a travel time between two sites. The predicted travel time may be applied as input from

20 user terminal 2, or information provided on Internet 4 may be used. When information provided on Internet 4 is used, route guidance device 1 automatically accesses a site that provides the information to obtain information on predicted travel times. Since real-time information

25 is used as the predicted travel time for major roads in this case, the accuracy in calculating the route travel

time can be increased.

Site-to-site information may further include event
information. Event information include information
regarding time blocks in which roads are blocked or
5   traffic regulated for such events as marathons and
parades, which information are considered when extracting
routes. Since routes can thus be extracted that do not
pass via blocked roads or roads in which traffic flow is
limited, the extracted routes can be reliably traveled.
10   For example, routes are excluded that pass by way of
roads that are blocked by a marathon during certain time
blocks.

The site information stored in site information
storage unit 15 and the site-to-site information stored
15   in site-to-site information storage unit 16 may be used
not only in extracting a route at a particular time but
in extracting routes at a subsequent time.

A route that minimizes the amount of fuel such as
gasoline of an automobile may be extracted as the optimum
20   route. A plurality of vehicles of the same type are
typically used in a delivery service, and a standard
amount of fuel can be set for a particular distance.
Information on the standard fuel consumption on main
roads may also be included in the site-to-site
25   information. For example, past fuel consumption on main
roads can be recorded and standard fuel consumption then

19

calculated using an average of this past consumption.

Route guidance device 1 adds a correction to the standard fuel consumption on a congested road to thereby predict fuel consumption. Route guidance device 1 may

5 also revise fuel consumption according to the load being carried at a particular time. Routes can thus be directed to roads on which fuel consumption is at a minimum, thereby enabling a saving in fuel. The amount of exhaust gases such as CO_2 can also be reduced to mitigate harmful

10 effects on the environment.

In the present embodiment, route guidance device 1 may also periodically access traffic information-providing device 3 to obtain site-to-site information even when not extracting optimum routes.

15 Fig. 14 is a sequence chart showing an example of the operation of periodically updating site-to-site information, and Fig. 15 is a sequence chart showing an example of extracting optimum routes in such a case.

As shown in Fig. 14, route guidance device 1

20 accesses traffic information-providing device 3 to obtain site-to-site information at a fixed time interval and updates the content of site-to-site information storage unit 16. Site-to-site information of route guidance device 1 is therefore always kept up-to-date.

25 As shown in Fig. 15, when site information is reported from user terminal 2 to route guidance device 1,

route guidance device 1 extracts the optimum routes using the periodically updated site-to-site information stored in site-to-site information storage unit 16 and reports the extracted optimum routes to user terminal 2.

5   Since the site-to-site information are thus periodically updated, route guidance device 1 does not need to access traffic information-providing device 3 with each extraction of optimum routes, and the time required for extraction of routes therefore is reduced.

10   Storage unit 14 of route guidance device 1 (site information storage unit 15, site-to-site information storage unit 16, and map information storage unit 17) is a computer readable/writable recording medium that is realized by a hard disk device, a magneto-optical disk 15 device, nonvolatile memory such as flash memory, volatile memory such as RAM (Random Access Memory), or a combination of these memory types. Processor 10 (site information-receiving unit 11, site-to-site information input unit 12, and optimum route extraction unit 13) may 20 be realized by dedicated hardware, or alternatively, by recording a program for realizing these functions onto a computer-readable/writable recording medium, reading the program that has been recorded onto this recording medium into a computer system, and then executing the program. 25 The computer-readable recording medium refers to a recording medium such as a floppy disk, magneto-optical

disk, or CD-ROM and storage devices such as a hard disk

device that is incorporated in a computer system. In

cases such as when a program is sent by way of the

Internet, a computer-readable recording medium further

5   includes an entity that dynamically holds a program

during a short period of time (a transmission medium or

a transmission wave), and entities that hold a program

for a fixed time in such cases, such as the volatile

memory in a computer system that functions as a server.

10   While preferred embodiments of the present

invention have been described using specific terms, such

description is for illustrative purposes only, and it is

to be understood that changes and variations may be made

without departing from the spirit or scope of the

15   following claims.